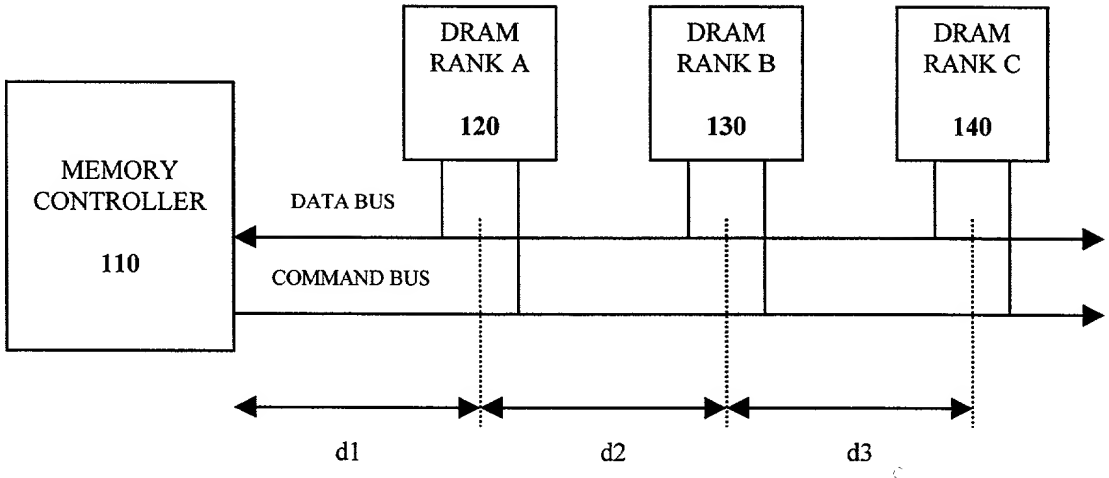
DRAM
RANK A
120
DRAM
RANK B
130
DRAM
RANK C
140
MEMORY
CONTROLLER
110
DATA BUS
COMMAND BUS
d1
d2
d3

FIG. 1

Read Cmd to Rank C		Read Cmd to Rank A	1st Read Cmd at C 2nd Read Cmd at A		1st Read Data from C 2nd Read Data from A	2nd Read Data from A Received at Controller		1st Read Data from C Received at Controller	
CLOCK 1	CLOCK 2	CLOCK 3	CLOCK 4	CLOCK 5	CLOCK 6	CLOCK 7	CLOCK 8	CLOCK 9	CLOCK 10
201	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**

FIG. 2

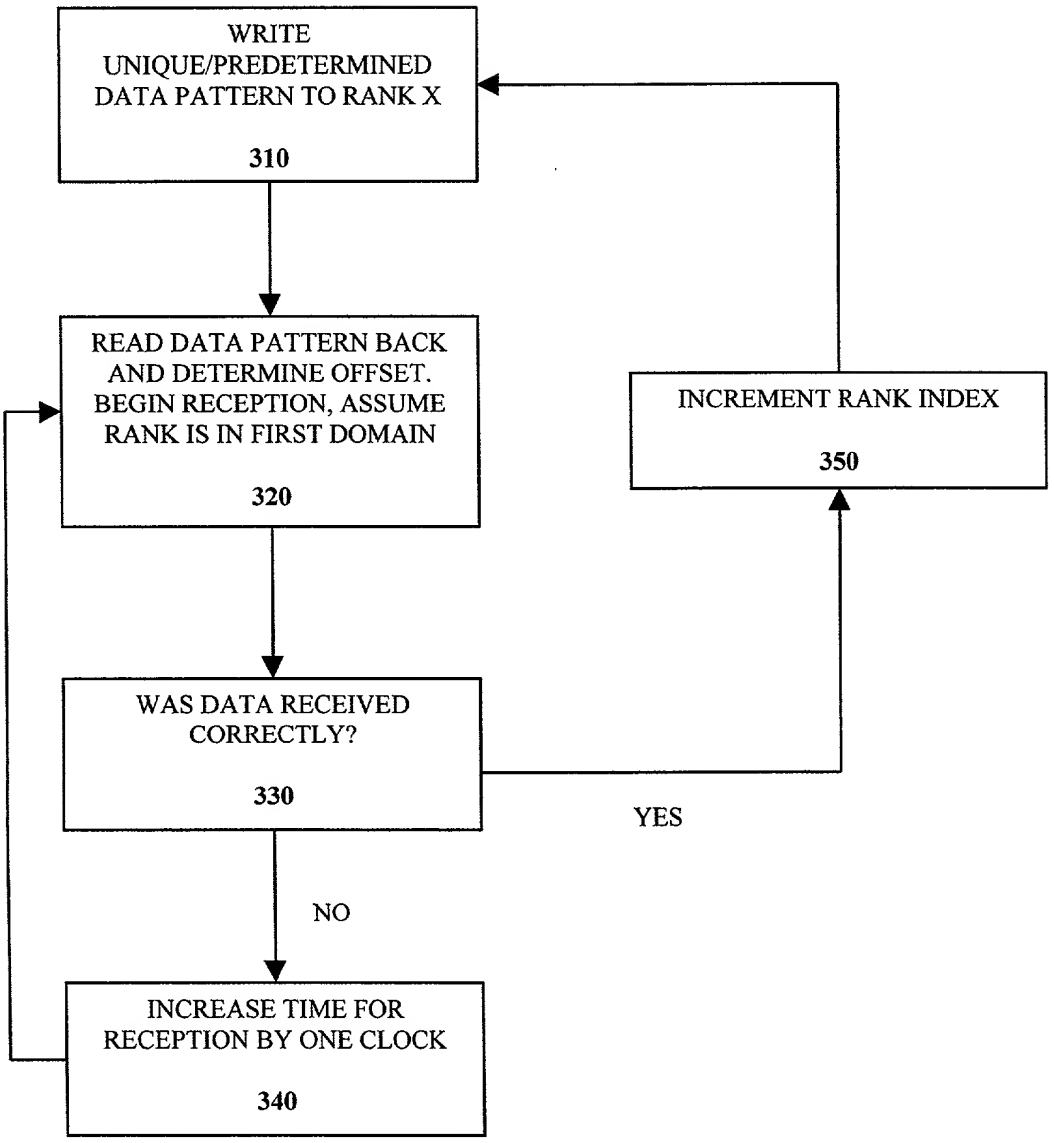
WRITE UNIQUE/PREDETERMINED DATA PATTERN TO RANK X
310
READ DATA PATTERN BACK AND DETERMINE OFFSET. BEGIN RECEPTION, ASSUME RANK IS IN FIRST DOMAIN
320
WAS DATA RECEIVED CORRECTLY?
330
YES
NO
INCREMENT RANK INDEX
350
INCREASE TIME FOR RECEPTION BY ONE CLOCK
340

FIG. 3

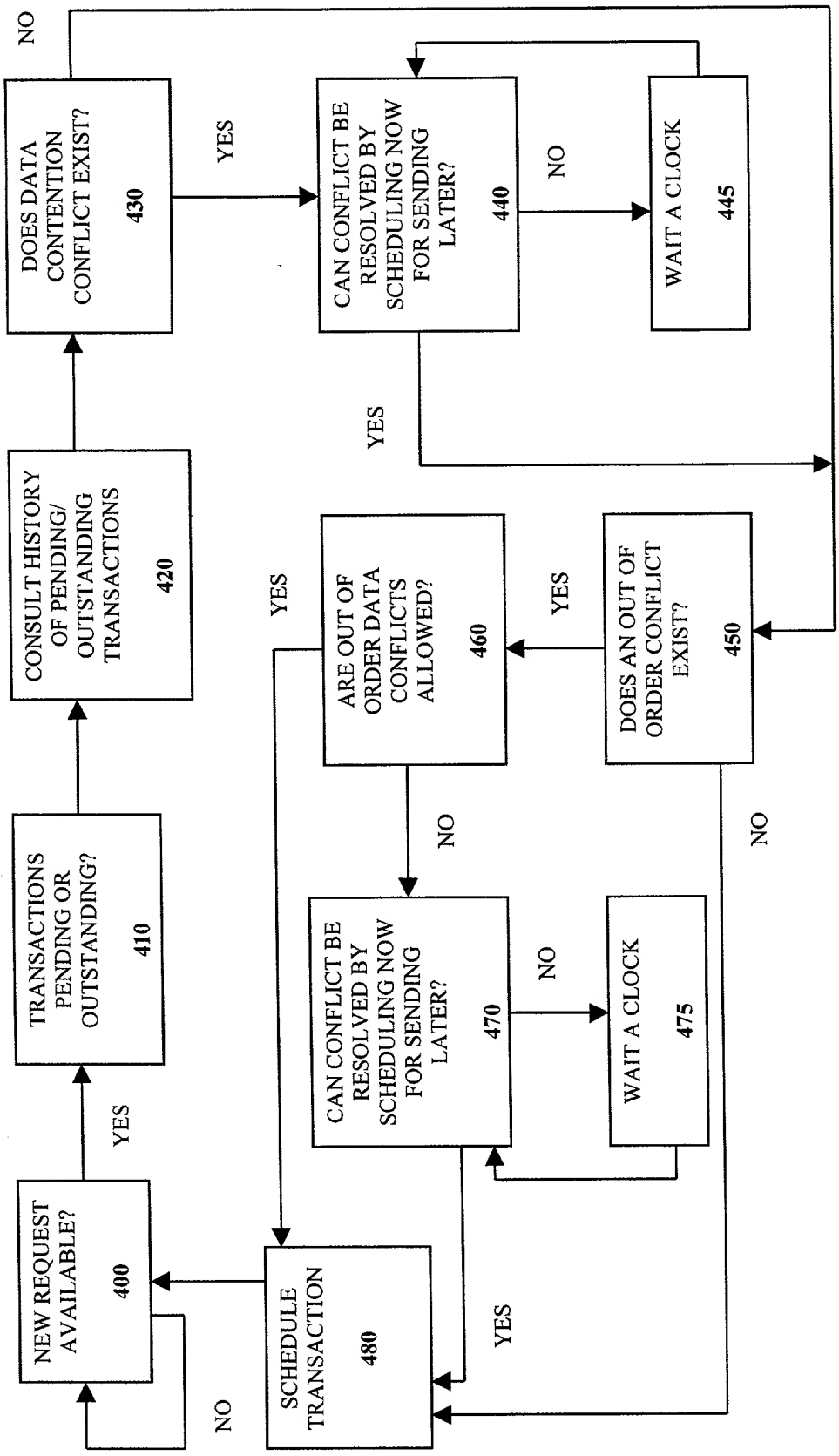
NEW REQUEST AVAILABLE? 400
YES
NO
TRANSACTIONS PENDING OR OUTSTANDING? 410
CONSULT HISTORY OF PENDING/ OUTSTANDING TRANSACTIONS 420
DOES DATA CONTENTION CONFLICT EXIST? 430
YES
NO
CAN CONFLICT BE RESOLVED BY SCHEDULING NOW FOR SENDING LATER? 440
NO
WAIT A CLOCK 445
YES
DOES AN OUT OF ORDER CONFLICT EXIST? 450
YES
ARE OUT OF ORDER DATA CONFLICTS ALLOWED? 460
YES
NO
CAN CONFLICT BE RESOLVED BY SCHEDULING NOW FOR SENDING LATER? 470
NO
WAIT A CLOCK 475
NO
SCHEDULE TRANSACTION 480
YES

FIG. 4

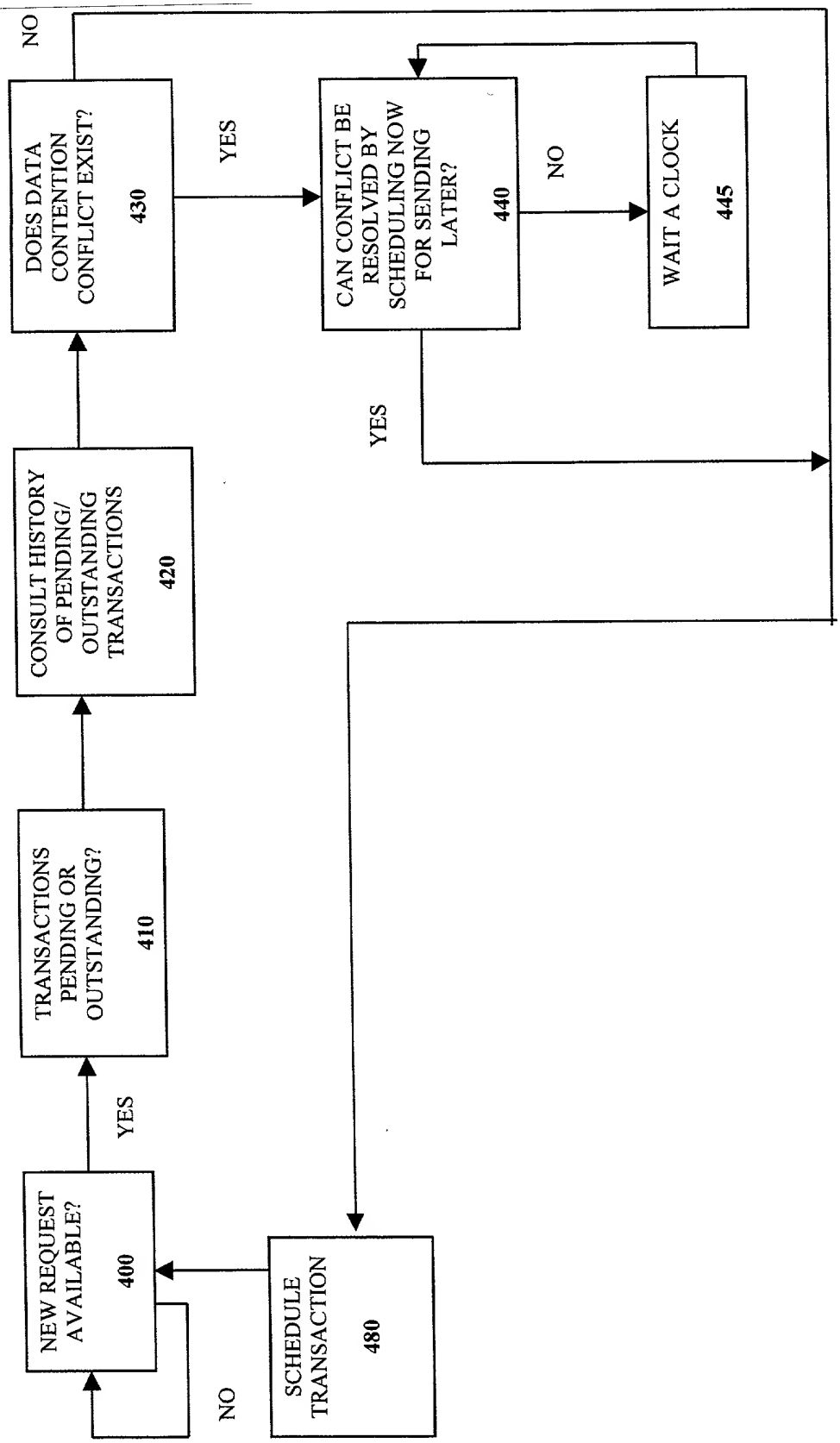
NEW REQUEST AVAILABLE? 400
NO
YES
TRANSACTIONS PENDING OR OUTSTANDING? 410
CONSULT HISTORY OF PENDING/ OUTSTANDING TRANSACTIONS 420
DOES DATA CONTENTION CONFLICT EXIST? 430
NO
YES
CAN CONFLICT BE RESOLVED BY SCHEDULING NOW FOR SENDING LATER? 440
NO
YES
WAIT A CLOCK 445
SCHEDULE TRANSACTION 480

FIG. 5

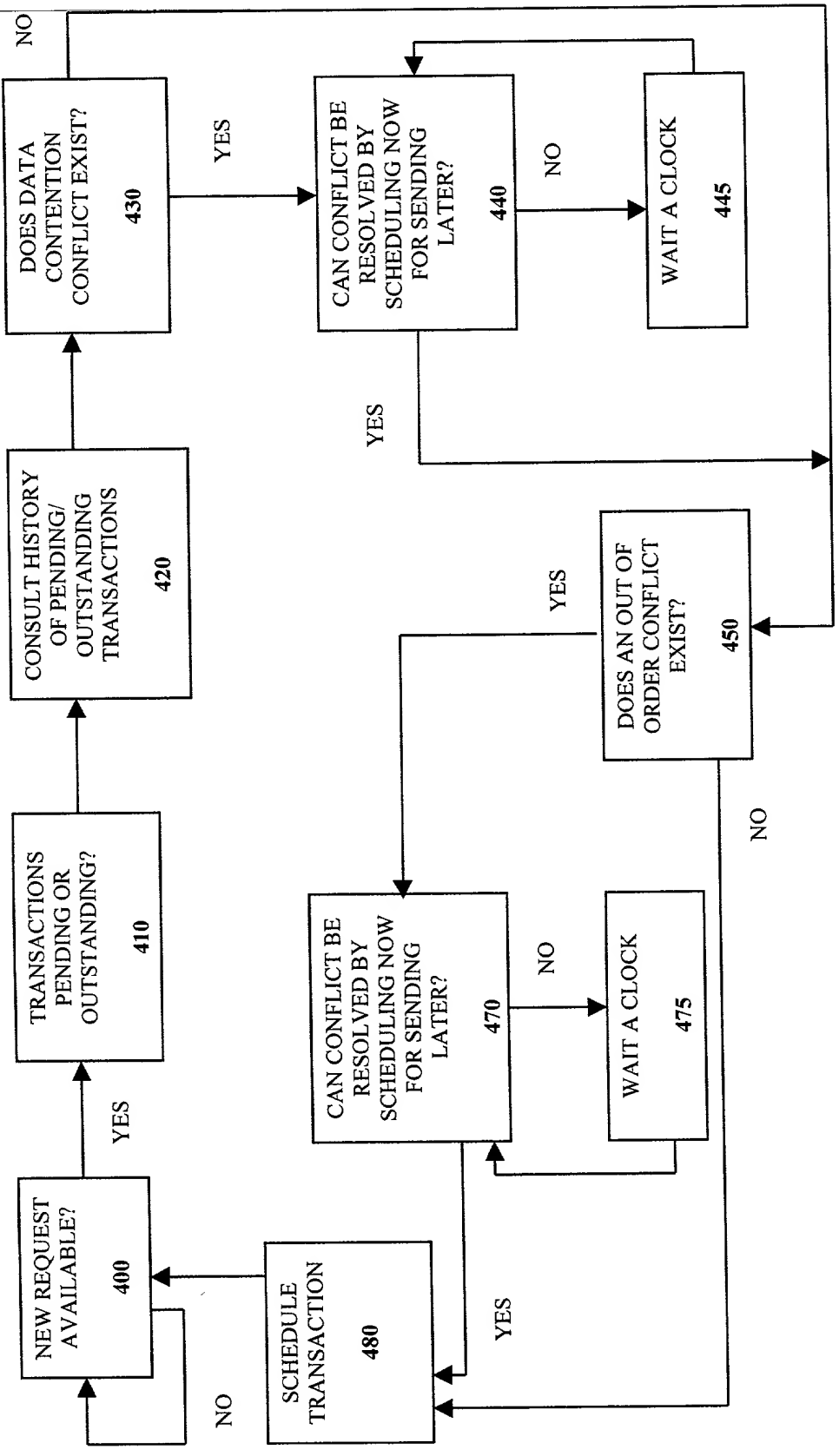
NEW REQUEST AVAILABLE? 400
YES
NO
TRANSACTIONS PENDING OR OUTSTANDING? 410
CONSULT HISTORY OF PENDING/ OUTSTANDING TRANSACTIONS 420
DOES DATA CONTENTION CONFLICT EXIST? 430
YES
NO
CAN CONFLICT BE RESOLVED BY SCHEDULING NOW FOR SENDING LATER? 440
NO
WAIT A CLOCK 445
YES
DOES AN OUT OF ORDER CONFLICT EXIST? 450
YES
NO
CAN CONFLICT BE RESOLVED BY SCHEDULING NOW FOR SENDING LATER? 470
NO
WAIT A CLOCK 475
YES
SCHEDULE TRANSACTION 480

FIG. 6